Revised Draft (August 17, 2000)

Utah Division of Air Quality

Modeling Guidelines

Utah Division of Air Quality

Technical Analysis Section

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Preface

Industry and control agencies have long expressed a need for consistency in the application of air quality models for regulatory purposes. This Utah Division of Air Quality (UDAQ) guideline document provides a common basis for estimating the air quality concentrations used in assessing control strategies and developing emission limits.

The continuing development of new air quality models and dispersion modeling techniques, in response to regulatory requirements and the expanded requirements for models to cover even more complex problems have emphasized the need for periodic review and update of this guidance document. Three on-going activities provide direct input to revisions of these guidelines. The first activity consists of UDAQ staff meetings conducted for the purpose of ensuring consistency and providing clarification in the application of models. The second activity, directed toward the improvement of modeling procedures, is the cooperative agreement that UDAQ has with the Environmental Protection Agency (EPA) and the scientific community. This agreement provides scientific assessment of procedures and proposed techniques, and sponsors workshops on key technical issues. The third activity is the solicitation and review of new models from the technical and user community. In the March 27, 1980 Federal Register, a procedure was outlined for the submittal to EPA of privately developed models. After extensive evaluation and scientific review, the models and modeling techniques are made available by EPA, for use in regulatory modeling analyses.

This document embodies revisions to the "Utah Division of Air Quality Modeling Guidelines." It is intended to be used in conjunction with the Notice of Intent Guide by sources seeking an Approval Order from the Utah Division of Air Quality. Although the text has been revised since its original publication, the present content and topics are similar. As necessary, new sections and topics are included. The UDAQ does not make changes to the guidance on a predetermined schedule, but rather on an ‘as needed’ basis. Changes in UDAQ modeling policy as a result of new regulatory actions or scientific data may not warrant immediate revision to this document. Therefore, this document shall remain in draft status. The UDAQ believes that revisions to this guideline should be responsive to user needs and should involve public participation to the greatest possible extent. Information on the current changes not reflected in this modeling guidance document may be obtained from the UDAQ modeling staff.

List of Acronyms & Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AO	Approval Order
AQRV	Air Quality Related Values
BBS	Bulletin Board System
BPIP	Building Profile Input Program
CO	Carbon Monoxide
EPA	Environmental Protection Agency
ETF	Emissions Threshold Factor
ETV	Emission Threshold Value
FDM	Fugitive Dust Model
FLM	Federal Land Manager
GAQM	Guidelines on Air Quality Models
GEP	Good Engineering Practice
HAP	Hazardous Air Pollutant
MACT	Maximum Achievable Control Technology
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen Dioxide
NOI	Notice of Intent
NSR	New Source Review
PM_{10}	Particulate Matter less than 10 microns in diameter
PSD	Prevention of Significant Deterioration
SO_2	Sulfur Dioxide
TLV	Threshold Limit Value
TPY	Tons Per Year
TSL	Toxic Screening Level
TTN	Technical Transfer Network
UACR	Utah Air Conservation Rules
UDAQ	Utah Division of Air Quality
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compound

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Utah Division of Air Quality
Modeling Guidelines

The modeling guidelines outlined herein are based upon EPA documents, and the Utah Air Conservation Rules (UACR). In case of contradictions between these guidelines and the EPA documents or the UACR, the EPA documents and the UACR prevail.

I. Sources Requiring Dispersion Modeling

New sources, or a significant modification to an existing source, may require computer dispersion modeling to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments (UACR307-410-3), or to provide documentation of the potential impact of hazardous air pollutant releases (UACR307-410-4). Sources whose emissions are covered under the requirements of UACR307-401-1 would be included. The Utah Division of Air Quality (UDAQ) has established minimum emission rate increase levels for new sources, or emission increase levels for existing sources , for which modeling is required to be performed by the applicant source.

The extent of the required modeling necessary will vary from one source to another. For new or modified sources, compliance may be shown by using simple screening techniques, such as the SCREEN3 model or other applicable screening models. If compliance can be properly demonstrated with the use of a screening model, no further modeling will be required. Sources that cannot properly demonstrate compliance using screening techniques are required to use a more refined model(s) with representative meteorological data in their analyses. Complex multi-point emitting sources, or sources with unusual pollutant dispersion environments for which screening techniques are not applicable, would also be required to use a more refined modeling technique (See SCREEN3 users guide requirements for combined stack modeling).

Applicants are encouraged to contact the UDAQ modeling staff prior to conducting any modeling analysis to define the extent of modeling, if any, that would be needed. Such contact would help to ensure the completeness of any modeling analysis submitted to the UDAQ, thereby expediting the review process. Applicants preparing modeling analyses are further advised to reference the EPA 'Guidelines on Air Quality Models', EPA-450/2-78-027A for details concerning the proper use of acceptable air dispersion models. Reference documents used in the preparation of these guidelines, which may assist the applicant in the preparation of a modeling analysis, are listed at the end of this publication.

a. Criteria Pollutants Impacts in Attainment Areas

New sources, or modifications to existing sources, whose total controlled emission increase levels are greater than those listed in Table 1 (ie., Table 4 of UACR307-410-3) are required to submit a dispersion modeling analysis as part of a complete Notice of Intent (NOI). Dispersion modeling analyses conducted for criteria pollutant sources must demonstrate compliance with all applicable NAAQS and PSD increment ceilings (UACR307-401-6). In the case of relocating portable equipment to another temporary location (actual equipment operation period not to exceed 180 work days per calender year with the length of the temporary AO not to exceed 365 consecutive days), dispersion modeling is required only to address the impact of the source on NAAQS.

Previously permitted sources that seek a modification to an existing AO may be excused from this requirement if a review of the modification and previously submitted dispersion modeling information indicates that the applicable NAAQS or PSD increments will not be violated (UACR307-410-3).

New sources, or modifications to existing sources, whose total controlled emission increase levels are less than those listed in Table 1 may also require dispersion modeling if unusual conditions concerning the source or its surrounding environment warrant further review. Unusual conditions to be considered would include such factors as: special meteorological events that may occur, elevated terrain close to the facility, pollutant release mechanisms which result in

low final plume heights (i.e., low pollutant release heights, low gas exit temperature or exit velocity, or horizontal or restricted venting system), or any other conditions that would inhibit dispersion once the pollutant leaves the exhaust control system. Such sources will be reviewed by the UDAQ at the discretion of the Executive Secretary.

Table 1: Total Controlled Emission Rates (in TPY) for New Sources, or Emissions Increase Levels for Existing Sources, where Dispersion Modeling may be Required.

Pollutant	Emissions Levels to Require Modeling
SO_2	40
NO_2	40
PM_{10} - fugitive emissions	5
PM_{10} - nonfugitive emissions	15
CO	As Required under UACR307-405-6
Lead	0.6

b. Criteria Pollutants Impacts in Nonattainment Areas

The UDAQ currently does not require dispersion modeling for nonattainment pollutant sources in, or seeking to locate in the respective nonattainment area. Nonattainment pollutant sources in these areas, however are required to:

1) Obtain emission offsets for NO_2, SO_2, and PM_{10}, if the combined emissions of NO_2, SO_2, and PM_{10} is greater than 25 TPY(UACR307-403-5). The offset ratio for these sources is;
   a) 1:1 for sources of NO_2, SO_2, and PM_{10} greater than 25 TPY, but less than 50 TPY combined.
   b) 1.2:1 for sources of NO_2, SO_2, and PM_{10} greater than 50 TPY combined.

2) Limit the source's combined NO_2, SO_2, and PM_{10} impact on the non-attainment area to 1.0 $\mu g/m^3$ annually and 3.0 $\mu g/m^3$ for a 24-hour averaging period, if the source's combined emissions of NO_2, SO_2, and PM_{10} is greater than 25 TPY, and the source is located outside a nonattainment area (UACR307-403-5). For sources of CO located outside a non-attainment area, the maximum allowable impact on the non-attainment area is 2000 $\mu g/m^3$ for a 1-hour averaging period and 500 $\mu g/m^3$ for an 8-hour averaging period (UACR307-403-3).

3) Obtain VOC emission offsets of 1.15:1, if the combined emission of VOCs is greater than 100 TPY.

As of the date of this revision, the areas presently designated as non-attainment or maintenance are:

PM_{10} - Salt Lake and Utah County

O_3 - Salt Lake and Davis County (O_3 Maintenance Areas)

CO - Ogden, Provo-Orem and Salt Lake City

SO_2 - Salt Lake County and Tooele County above 5,600 ft.

c. Hazardous Air Pollutants

Effective January 1, 1998, UACR307-410-4 requires applicant sources proposing any increase of HAPs emissions to submit all HAP emission levels and pollutant release information for their facility. UACR307-410-4 further requires each source to submit:

1) The estimated maximum lb/hr emission rate increase of each type HAP from all relevant emission points or areas.
2) The type of pollutant release, whether it is *vertically 'restricted'*, (ie., fugitive emissions, horizontally directed releases to include side venting, elbows, raincaps, and stack point release levels with a stack height to building ratio less than 1.3:1), or *vertically 'unrestricted'* (ie., unobstructed vertically directed emission release point having a stack height to building ratio greater than or equal to 1.3:1).

3) The maximum release duration in minute per hour. This value is critical for evaluating batch process releases of acute HAP. For acute HAP releases having a duration period less than one hour, this maximum pounds per hour emission rate will need to be scaled so that it is consistent with an identical operating process having a continuous release for a one-hour period or more.
4) The release height of the emission point or area as measured from ground level.
5) The height at the peak of any adjacent building or structures which may cause building downwash of the HAP emissions (any building located within a distance equal to or less than 5 times it's own height from an emission release point may have a building downwash effect on that release point if the stack height to building height ratio is less than 2.5:1).
6) The shortest distance from each release point to any area defined as 'ambient air' under 40 CFR 50.1(e).
7) The emission threshold value (ETV - emission level above which a dispersion modeling analysis is required as part of a complete NOI), equal to the HAP's threshold limit value (TLV) times the appropriate emission threshold factor (ETF) in Table 2 (ie., Table 5, UACR307-410-4). Expressed as: ETV = TLV x ETF.

The emission threshold value establishes a modeling trigger level which is representative of a) the toxicity of the HAP, b) the type of health effects which may result from exposure to the HAP, c) the dispersion potential of the release mechanism through which the pollutant exits, and d) the distance the plume would be transported before reaching ambient air. Industrial facilities proposing a single release point for the HAP may use the Method 1 approach outlined in Appendix I (found at end of this document) to calculate their appropriate ETV. Facilities proposing multiple release points of a HAP may use either Method 1 or 2. In the case of arsenic, benzene, beryllium, and ethylene oxide, ETVs for these HAPs shall be calculated using chronic ETFs, and for formaldehyde, using an acute ETF (UACR307-410-4.1c).

Table 2: Emission Threshold Factors (ETF) for Hazardous Air Pollutants (in lb/m^3 / mg/hr)

Distance to Property Boundary	Acute HAP	Chronic HAP	Carcinogenic HAP
Vertically Restricted and Fugitive Emission Release Points			
20 meters or less	0.038	0.051	0.017
21 - 50 meters	0.051	0.066	0.022
51 - 100 meters	0.092	0.123	0.041
Beyond 100 meters	0.180	0.269	0.090
Vertically Unrestricted Emission Release Points			
50 meters or less	0.154	0.198	0.066
51 - 100 meters	0.224	0.244	0.081
Beyond 100 meters	0.310	0.368	0.123

Applicant sources proposing to increase their plant-wide HAP emission levels by an amount greater than or equal to the ETV must submit a modeling analysis which addresses the impact of the HAP increase (UACR307-410-4.1c). The UACR further requires that sources whose HAP analyses indicated ambient air concentration levels greater than the HAP's toxic screening level (TSL) as outlined in Section II.b of this document are required to submit additional information relating to a) the symptoms and adverse health effects that can be caused by the HAP, b) exposure conditions or dose rates sufficient to cause the adverse effects, c) a description of human population or biological species which could be exposed to the HAP, d) land use for the impacted areas, and e) the environmental fate and persistency.

d. Volatile Organic Compounds

Volatile organic compounds (VOC) are precursors to ozone formation and may be modeled under the assumption that all of the pollutant will be converted to ozone (1:1). However, in the atmosphere, the reaction equilibrium between ozone precursors is reached prior to a complete conversion. Thus, the UDAQ feels that the 1:1 conversion method is overly

conservative, resulting in an impossible compliance situation. Conversion of VOCs to ozone can be realistically estimated through the use of a reactive plume model, however, in most permitting cases of new or modifying VOC sources, such a modeling effort could be considered impractical due to the cost, labor, and applicability of the modeling effort. Currently, the UDAQ does not require these sources to conduct dispersion modeling for VOC to ozone conversion as part of the NSR permitting process. The UDAQ, however, continues to explore research associated with estimating VOC to ozone conversion, and may in the future adopt a modeling methodology to address the impact of permitting sources of VOCs.

II. Criteria Pollutant Standards and Toxic Screening Levels

a. Criteria Pollutants

The State of Utah has adopted the federal NAAQS and PSD increment consumption limits for criteria pollutants to protect and preserve the air quality for its people and the environment, as listed in 40CFR, Part 50 and Part 51. All sources seeking an AO from the State of Utah must comply with all applicable NAAQS and PSD increments appearing in Table 3 below.

Table 3 : State of Utah Air Quality Standard for Criteria Pollutants. (in µg/m^3)

		NAAQS		PSD CLASS INCREMENTS		
POLLUTANT	**AVERAGING TIME**	**PRIMARY**	**SECONDARY**	**I**	**II**	**III[e]**
SO_2	**3-HR[a]**		1300	25	512	700
	24-HR[a]	365		5	91	182
	ANNUAL[b]	80		2	20	40
PM_{10}	**24-HR [d]**	150	150	8	30	60
	ANNUAL [d]	50	50	4	17	34
$PM_{2.5}$	**24-HR [d]**	65	65			
	ANNUAL [d]	15	15			
NO_2	**ANNUAL[b]**	100	100	2.5	25	50
O_3	**8-HR[c d]**	157	157			
CO	**1-HR[a]**	40000				
	8-HR[ac]	10000				
Pb	**3-Month[b]**	1.5				

a - Not to be exceeded more than once per year. **b** - Never to be exceeded. **c** - 8-hour averaging period based on an 8-hour running average
d - Statistical evaluation of mean required . **e** - No PSD Class III areas presently exist in the State of Utah.

New or major modifications to PSD sources that are predicted to consume more than 50% of the available increment in their PSD increment consumption analysis, are subject to approval by the Utah Air Quality Board (UACR307-401-6)).

b. Toxic Screening Levels

The UDAQ has adopted Toxic Screening Levels (TSLs) to assist in the evaluation of hazardous air pollutants released into the atmosphere from sources seeking a new or modified AO. The TSLs do not constitute a standard which the impact of a source's toxic emissions cannot exceed. Rather, they are screening levels above which the UDAQ has determined that additional information should be obtained to substantiate that the model-predicted concentration would not expose sensitive individuals, animals, or vegetation, to unnecessary health risks.

TSLs are derived from Threshold Limit Values (TLVs) listed in the American Conference of Governmental Industrial Hygienists (ACGIH) - "Threshold Limit Values for Chemical Substances and Physical Agents." Values reported in the ACGIH handbook are based on specific exposure limits to a healthy adult in the work place. Persons who would be overly sensitive to such an exposure, such as children, the elderly, or the physically ill, would require thresholds lower than the TLVs. To ensure protection for sensitive individuals and to facilitate the use of longer concentration averaging periods for chronic and carcinogenic HAPs, uncertainty factors were applied as follows:

TLV divided by 10 - relate the threshold of an average healthy adult to that of a sensitive individual.
TLV divided by 3 - converts the 8-hour TLV to a 24-hour concentration (chronic and carcinogenic HAPs only).
TLV divided by 3 - additional safety factor for carcinogens.

The above uncertainty factors when applied to the TLVs result in the following TSLs and concentration averaging periods for comparison with model-predicted concentrations;

Acute HAPs - TLV / 10 (instantaneous concentration), averaging period of 1-hour or less depending on model used;
Chronic HAPs - TLV / 30, 24-hour averaging period;
Carcinogenic HAPs - TLV / 90, 24-hour averaging period. - known or suspected carcinogenic hazardous air pollutants.

III. PSD Class I Areas and Air Quality Related Values

The Federal Land Managers (FLMs) have established Air Quality Related Values (AQRVs) to address the impact of a source on PSD Class I area such as acid deposition, regional haze, and the degradation of sensitive species issues. Areas presently under the protection of Class I designations in the State of Utah are Arches National Park, Bryce Canyon National Park, Canyonlands National Park, Capitol Reef National Park, and Zion National Park (UACR-307-1-3.6.1.A). The impact on Class I areas in other states may also need to be addressed.

Applicants are advised to contact the modeling staff at the UDAQ for information concerning the modeling methodology for individual Class I area AQRVs. New or major modifications to PSD sources are required to address their impact on all Class I areas within 100 km of the subject sources. The source's impact on Class I areas beyond 100 km may also need to be addressed, if it is determined that the source's emission rate or pollutant release method may contribute to uninhibited long-range transport. PSD sources that proposes to permit any net emissions increase and is located within 10 km of a Class I area, is also required to conduct a PSD Class I increments analysis. If the maximum predicted impact on the Class I area exceeds 1 $\mu g/m^3$ on a 24-hour basis, the emissions increase is considered significant, and constitutes a major modification subject to PSD review (40 CFR 52.21(b)(23)(iii)).

IV. Modeling Protocol

Before conducting a refined modeling analysis, applicants are required to submit to the UDAQ a written modeling protocol detailing the modeling analysis methodology. Applicants must submit the following materials with their modeling protocol: an emission inventory, a list of source stack and building parameters, and a meteorological representiveness analysis. Sources that have collected on-site meteorological data are not required to submit the meteorological representitiveness analysis with their modeling protocol, since that information should have been submitted to the UDAQ in the on-site meteorological monitoring protocol.

Information detailed in the modeling protocol should include the following:

1. Source/site description, including stack(s) location in UTM coordinates and a scaled drawing of the facility's building structural layout.
2. Emission rates, source type, source release parameters (point, volume, or area source model input parameters), and operating schedules for the new or modified source(s).
3. Emission rates, source type, source release parameters, and operating schedules for any existing source(s) at the facility.

4. Emission rates, source type, and source release parameters for all surrounding sources which would have an additive impact with the subject source (generally applies to PSD sources only).
5. Discussion of surrounding terrain and the effects it will have on pollutant dispersion.
6. The model(s) to be used in the analysis, and an explanation of why the model(s) would be applicable.
7. Technical options to be used with the model(s).
8. The type of meteorological data which will be used in the analysis, its origin, period it represents, and the manner in which it was collected, processed, and verified for quality assurance and site representativeness.
9. Receptor grid(s) type and spacing to be used in the analysis.
10. Background concentrations and background monitor location to be used in the analysis.
11. Air quality standards or toxic screening levels to be addressed in the analysis.

The modeling protocol will be reviewed by the UDAQ modeling staff. In most cases, applicants will be notified in writing of the approval, or changes necessary to obtain approval, by the UDAQ within 5 working days of receiving the written modeling protocol. Applicants should be aware that an approved modeling protocol does not necessarily limit the extent of the modeling that will be required to demonstrate compliance with all standards. It is often the case that during the course of the State's review process, previously unseen issues will arise, as information detailing the source's possible impact on the surrounding environment is revealed. The modeling protocol serves to identify the appropriate framework for the impact analysis and to expedite the UDAQ's review.

Refined modeling analyses submitted to the UDAQ without a complete written protocol may be rejected, and returned to the applicant.

V. Air Quality Models

a. EPA Preferred Models

Applicants should consult with the UDAQ prior to the selection of a particular model(s) in order to ensure that its use is appropriate for the type of analysis being performed. The UDAQ accepts the use of EPA approved models for regulatory analyses. Models which do not fall under the category of "EPA Preferred Models" as defined in the EPA "Guidelines on Air Quality Models (GAQM)",EPA-450/2-78-027R, are subject to the approval of the UDAQ prior to their use in a regulatory modeling analysis. Dispersion models previously approved by EPA for use in a regulatory modeling analysis, and the supporting documentation, are available to the public at no cost, through the EPA - Technology Transfer Network (TTN) on the Internet at http://www.epa.gov.

For dispersion modeling within a 50-km (31 miles) radius of the modeled source, the EPA recommended steady state guassian plume model are SCREEN3, ISCST3, ISC3-PRIME, and AERMOD. The ISC3 and SCREEN3 models incorporate the COMPLEX 1 source code to allow users to evaluate pollutant impact in simple, intermediate, and complex terrain during a single execution of the model.

The use of a steady state guassian plume model beyond a distance of 50 km may produce overly conservative concentrations. Steady state modeling results will be accepted for receptor distances beyond 50 km, as a conservative screening method (i.e. modeling results predict concentration levels less than the applicable standard). For dispersion modeling beyond a distance of 50 km, EPA recommends the use of a guassian puff superposition model CALPUFF.

b. Technical Options

Technical option to be selected for regulatory modeling are outlined in the GAQM document. Any selection of a technical option which deviates from regulatory guidelines, is subject to prior approval by the UDAQ. Applicants are required to inform the UDAQ of any intent to make changes in a model source code, which requires the written approval of EPA, if the proposed change will alter in any way the concentrations predicted by the model (UACR307-410-2).

c. Proprietary Models and Software

The UDAQ recognizes the use of proprietary software ('user friendly') in regulatory analyses. Applicants are required to inform the UDAQ if they plan to use a proprietary models or software in their analyses. The UDAQ may require applicants to submit software and source codes to aid in the review of the analysis. The UDAQ recognizes the ownership right of all proprietary software, and therefore cannot release any proprietary models, support software, or documentation to the public without the prior approval of the software vendor. Applicants are encouraged to contact software vendors with any questions concerning the specific operations of proprietary software.

VI. Source Data

a. Emission Rates

Applicant should exercise caution when proposing emission rates for any modeling analysis. Modeled emission rates should be representative of the averaging period(s) for which impacts are being determined. The emission rate used in the modeling analyses to establish maximum short-term concentrations (24 hours or less) should be representative of the pending AO's permitted maximum allowable emission level for that time period, unless it can be documented that the subject source routinely operates at a significantly lower emission rate (in line with federally enforceable operating limits).

For buoyant plumes, maximum concentrations may be associated with operating levels less than 100%. Hence, maximum concentrations resulting from stack parameters reflecting operating levels of 50% and 75% may also need to be addressed if operating the facility in a partial load capacity will result in a decrease in the height of the model predicted plume rise.

Relevant stack test parameter data should be incorporated in a modeling analysis whenever available. When actual source parameters are not available, applicants are encouraged to consult with the UDAQ to determine source parameters which are closely representative and conservative.

For determining PSD increment consumption, the baseline date for PSD and minor sources with respect to NO_2, SO_2, and PM_{10} has been triggered for the entire state of Utah. The baseline date for all NO_2 sources is April 21, 1988. The baseline date for minor SO_2 and PM_{10} sources is April 1, 1990. The baseline date for major SO_2 and PM_{10} sources is August 17, 1979.

b. Surrounding Source Contributions

All surrounding sources which will 'significantly' (as defined in the EPA's "New Source Review Workshop Manual") contribute to the impact of a new or major modifications to a source must be included in the modeling analysis. Applicants are required to research the area surrounding the subject source in order to identify any possible contributing sources. All sources greater than 25 tons per year which are located within 50 km of the subject source's area of significant impact should be included in the analysis. In most cases, criteria pollutant background concentrations may be substituted into a NAAQS analysis of a minor source.

Surrounding sources may also be excluded from the a modeling analysis if the user can demonstrate that the source does not significantly contribute to the area in which the subject source has a significant impact (UACR-307-1-3.3.2). This can sometimes be addressed using a simple screening model. The significant impact levels appears in Table 4. This table applies to Class II areas only. New or major modifications to PSD sources are advised to contact the UDAQ for details concerning FLM (Class I areas) significant impact levels and their range of applicability.

Table 4 : Significant Air Quality Impact for Determining Impact Area (µg/m^3)

Pollutant	Annual	24-Hour	8-Hour	3-Hour	1-Hour
SO_2	1	5		25	
PM_{10}	1	3			
NO_2	1				
CO			500		2000

c. Background Concentrations

Modeled concentrations must be added to the existing background concentration in order to evaluate the total impact relative to the NAAQS. Actual monitored background concentration values are available for most urban areas in Utah. Conservative background concentration values (and some actual monitored values) are available for rural areas throughout the state of Utah; however, this data may not be representative of actual pollutant background concentrations at the specific site. In cases where the UDAQ background concentrations are unreasonably conservative or are not representative of actual monitored background concentrations, the applicant source may be required to collect on-site ambient air quality data for use in their NAAQS analysis.

VII. Receptor Grids and Related Topics

a. Polar / Rectangular Receptor Grids

The model user may prefer to choose a receptor grid with receptors spaced at large intervals (coarse grid), in order to identify the areas where pollutant concentrations tend to be higher (hotspots). The UDAQ does not place any limits on the number or spacing of receptors for the purpose of coarse grid modeling; but the grid should be able to delimit the areas of highest possible impact. After the hotspots have been located, the user is required to remodel these areas with a receptor grid tight enough to ensure that the maximum point of impact has been identified (refined grid).

For refined receptor grids, the GAQM (p 8-4) states: "Receptor sites for refined modeling should be utilized in sufficient detail to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment." The reader is referred to section IV.D.2, pp C.39 - C.42 of the New Source Review Workshop Manual for a detailed discussion concerning receptor grid network design.

It is the applicant's responsibility to demonstrate that the final receptor network is sufficiently dense to identify the maximum estimated pollutant concentration for each applicable averaging period. This applies both to the PSD increments and to the NAAQS. In general, the receptor network will be considered adequate if the difference of concentrations at neighboring receptors is no larger than one-half the difference between the maximum modeled concentration and the NAAQS (or increment) under consideration; stated numerically:

$$*? _1 - ? _2* < 0.5 \text{ x } * \text{NAAQS (or increment)} - ? _{max} *,$$

where: $? _{(1 \text{ or } 2)}$ = Concentration at receptor 1 and 2 (adjacent receptors)
$? _{max}$ = Maximum concentration of receptors 1 and 2.

In addition to using a network of evenly spaced receptors, the applicant will need to add discrete receptors at locations such as: the boundary of the nearest Class I or nonattainment area, the location(s) of ambient air monitoring sites, and locations where potentially high ambient air concentrations are expected to occur.

b. 'Ambient Air' Boundary Receptors

Receptor spacing along the ambient air boundary is required to assess the impact of a source at the closest area considered to be 'ambient air'. EPA defines 'ambient air' in a January 21, 1986 policy memorandum (9) from Joseph A.

Tikvart to Regional Modeling Contacts, Regions I - X. In this memorandum, EPA states: "The policy is based on 40 CFR part 50.1 (e) which defines ambient air as ". . . that portion of the atmosphere, external to buildings, to which the general public has access. Exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and/or to which public access is precluded by a fence or other physical barriers."

c. Terrain Elevations

Simple terrain (terrain elevations below the level of pollutant release) and complex terrain (terrain elevations above the level of pollutant release) will need to be addressed in all modeling analyses if terrain within the vicinity of the subject source is expected to have an effect on pollutant dispersion. Modeling analyses which involve both simple and complex terrain must conform to the EPA intermediate terrain policy. Applicants may contact the UDAQ to determine the extent to which terrain effects will need to be addressed in their modeling protocol/analysis.

Terrain elevations for modeling analyses should be obtained from USGS databases. For refined-grid analyses, scaled maps should not exceed the 1:24000 scale (7.5 minute series quadrangle). Receptor elevations should be accurate to within ±1/2 contour interval although this restriction may be relaxed to ±1 contour interval for areas where contour intervals appear very close together. Larger scale maps will be considered for coarse-grid modeling where receptor spacing is 2000 meters or greater.

Digitized topographical data is now available in three levels of accuracy from the USGS. The most predominant data sets now available are Level I and II data. However, due to the inaccuracy of these levels of digitized data, only Level II data will be accepted for use in coarse-grid modeling where receptor spacing is 5000 meters, or greater. Level I and II digitized data will not be accepted by the UDAQ for use in refined-grid modeling analyses.

VIII. Meteorological Data

The meteorological conditions under which a pollutant is released into the atmosphere is the controlling determinant of dispersion efficiency in the air quality models. In most dispersion modeling analyses, the user will attempt to define the worst-case scenario for pollutant dispersion, thereby yielding the highest possible model predicted concentration.

a. Screening Meteorological Data

Screening models use a worst-case meteorological data set. Meteorological data in the SCREEN3 model simulates a full set of atmospheric conditions to calculate the highest possible concentration. SCREEN3, however, is limited to simulating dispersion from single, fairly simplistic sources. The UDAQ has constructed a worst-case data screening set using meteorological data assumptions from the SCREEN3 model for use with the ISCST3 model (for modeling multiple, more complex sources). The UDAQ will allow minor sources to use worst-case meteorological data in a refined screening model for NAAQS and PSD increment modeling analyses only if a representative actual meteorological data set is not available. Only 1-hour concentrations can be calculated using the worst-case meteorological data set. For other averaging periods, impacts must be calculated by applying the time-scaled conversion factors, listed in Table 5, to the model predicted 1-hour concentration.

b. Representative Meteorological Data

Ideally, a modeling analysis should attempt to simulate dispersion under conditions which would actually occur at a facility. Therefore, the UDAQ requires that actual meteorological data be used in a refined modeling analysis. New or major modifications to PSD sources will be required to collect at least one year of continuous on-site meteorological data for use in their modeling analyses. If on-site data is not available for modeling, representative data collected from another meteorological site might be used. Meteorological data used in modeling must be approved by the UDAQ for quality assurance and site representativeness prior to its use in a regulatory analysis. To demonstrate data representativeness, the applicant may provide an analysis comparing the physiographic and meteorological parameters of the data site using the minimum requirements which are detailed in Appendix II. In the case where the meteorological data is not determined to be representative, the applicant source may be required to collect on-site meteorological data.

The UDAQ requires that at least one full year of representative meteorological data be used in all refined modeling analyses. If more than one year of data is available, the user shall run the model with all available years, up to a maximum of five years. Sources required to gather on-site meteorological data are advised to contact the UDAQ to establish a monitoring protocol for locating a representative meteorological site and gathering the necessary meteorological data.

IX. Time Averaging Periods

Applicants preparing regulatory analyses are required to address all applicable NAAQS and PSD increment averaging periods which would apply to the pollutant being modeled. Some models such as SCREEN3, however, will only calculate 1-hour average concentrations (24-hour average if addressing complex terrain issues). EPA has established time-scaled persistence factors to convert 1-hour averages to other averaging periods (5). Time-scaled factors appear in Table 5. These time-scaled persistence factors are not to be applied with area source modeling for averaging periods of 24-hours or less.

Table 5 : Persistence Factors for Converting 1-Hour Averaging Periods.

Averaging Period	Persistence Factor	
	Flat and Simple Terrain	Complex Terrain
3-Hour	0.9	0.7
8-Hour	0.7	0.50
24-Hour	0.4	0.15
3-Month	0.12	na
Annual	0.08	0.03

X. Building Downwash

Air flow over and around buildings and other solid structures may restrict the dispersion of a pollutant source. When modeling release points where the release height is less than good engineering practice (GEP), the effects of building downwash will need to be addressed in the modeling analysis. The GAQM requires that EPA's 'Building Profile Input Program' (BPIP) or a proprietary version of BPIP be used to generate building profile input data for input to the ISCST3 or ISC3-PRIME model.

XI. Cavity Modeling

Applicant sources with release points located near their property boundary are required to submit a cavity region analysis with their modeling analysis. Cavity concentrations are considered to be a valid ground concentration when addressing NAAQS and PSD increment consumption, if the length of the cavity extends beyond a restricted property boundary. At the time of this revision, the SCREEN2C model is EPA’s preferred model for cavity concentrations, predicting results which are significantly more accurate than those predicted in SCREEN3 (as compared with wind tunnel testing results).

XII. Visibility (Plume Blight) Modeling

All new PSD or major modifications to PSD sources are required to conduct plume visibility modeling if they are deemed as having a significant impact (as discussed in Section III) in a Class I area (UACR-307-1-3.6.5.B). PSD sources that propose to permit any net emissions increase and who are located within 10 km of a Class I area are also required to conduct plume visibility modeling. EPA recommends the use of the VISCREEN model for visibility analyses. Applicants performing visibility modeling are advised to first perform a VISCREEN - Level I analysis. If the

source fails the Level I analysis, a Level II analysis should be performed. Visibility modeling use of the PLUVUE II model would then be recommended if the source fails both the VISCREEN Level I and II analyses.

XIII. Submittal Requirements

a. General Requirements

Applicants submitting regulatory modeling analyses to the UDAQ are required to include the following items, information, and documents with their modeling analysis:

1. A completed copy of the modeling checklist and summary sheets (Appendix I thru IV in hardcopy or electronic format).
2. A detailed description of the new source's proposed activity. For modified sources, a description of the proposed modification and the source's activity prior to and after the proposed modification.
3. A detailed description of the proposed new emission or change in emission level.
   a. Point sources - emission rate, stack height, stack diameter, temperature, exit velocity, and nearby building dimensions (downwash).
   b. Area sources - the height, area/dimensions, and average emission rate per unit area. Road emissions should include the length, surface type, silt content, and location/orientation.
   c. Volume sources - the release height, initial vertical and horizontal dimension, and emission rate.
   d. Flare Sources - emission rate, stack height, stack diameter, exit velocity, and total heat content.
4. A USGS - 1:24000 scale map showing the location of all sources and receptors used in the analysis.
5. A description of the model(s) selected and why it (each) was (were) selected.
6. A description of the site topography and receptor grids used in the analysis.
7. A description of meteorological data and why it is representative. Quality assurance documentation should also be included. Electronic copies of both ASCII and model compatible formatted meteorological data used in the analysis on 3.5 disk.
8. Technical support documentation for any assumptions made in the modeling analysis which deviate from GAQM.
9. Model input (regulatory compatible version) and output files in DOS format on 3.5 inch floppy disk along with file descriptions.
10. A summarization of model predictions showing compliance with NAAQS and PSD increment ceilings for both Class I and II areas. The summarization must include the information described in the following two subsections.

b. NAAQS

1. Table showing pollutants, averaging period, ambient standards, background concentration, highest (and second highest, if appropriate) modeled concentration, the model used, and the impact location in UTM's.
2. Concentration isopleth maps with facility boundary for each pollutant and averaging period out to 5% of the applicable standard, along with the ASCII file containing the x, y and q (concentration) coordinates from which the iso-pleth was plotted.

c. PSD Increment

1. Table showing pollutants, averaging periods, maximum increment consumed by both major and minor sources within 50 km of the subject source since the baseline date, the model used, and the impact location in UTM's.
2. Increment consumption isopleth maps, with facility boundary, for each pollutant and averaging period out to 5% of the increment ceiling, along with the ASCII file containing the x, y and q (concentration) coordinates from which the iso-pleth was plotted.

References

1. Clean Air Act of 1990. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

2. Guidelines on Air Quality Models. EPA-450/2-78-027R. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

3. Prevention of Significant Deterioration. 40 CFR 52.21. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

4. New Source Review Workshop Manual. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

5. EPA Screening Procedures for Stationary Sources. EPA-450-4-92-006. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

6. EPA - Technology Transfer Network (TTN) Bulletin Board System (BBS) (919/541-5742). EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

7. Utah Air Conservation Rules. R307-1. Utah Division of Air Quality, 150 North 1950 West, Salt Lake City, Utah 84114-4820.

8. Preparing Your Notice of Intent (NOI), The NOI Guide. Sixth Edition. Utah Division of Air Quality, 150 North 1950 West, Salt Lake City, Utah 84114-4820.

9. Policy Memorandum from Joseph A. Tikvart to Regional Modeling Contacts, Regions I - X. January 21, 1986. Definition of Ambient Air.

Appendix I

Methodology for Estimating Emissions Threshold Values for Hazardous Air Pollutants (HAPs)

The UACR307-410-4 requires sources submitting a NOI to document increases in HAP emissions. All NOI's requesting increases or new emissions of HAPs must submit the following information/documentation for each effected installation's pollutant release point or area:

1) the estimated maximum lb/hr emission rate of each HAP for each affected installation (UACR307-410-4.1c),
2) the type of release, the maximum release duration in minutes per hour, the release height, and the height of any surrounding building, and the distance to 'ambient air' (R307-1-3.7.3(C)(1)(b)), and
3) the emission threshold value in lb/hr (equal to the HAP's TLV divided by the appropriate emission threshold factor in Table 5) (R307-1-3.7.3(C)(1)(c)).

As requested under the rule, this information is used to *determine* if dispersion modeling is required to <u>further</u> document the source's emissions impact. Two methodologies have been developed to assist applicant sources in the implementation of the rule.

The first methodology is a screening method whereby the applicant chooses the lower emission threshold factor (ETF) which applies to the affected installations and multiples it times the HAP's TLV. This emission threshold value (ETV) is then compared against the amount of the proposed new or increase in emissions to determine if the emissions threshold for modeling is exceeded. The second methodology allows the applicant to weight each ETF that applies to an affected installation by the percentage of the total proposed new or increasing emissions level which will be released from each installation (in maximum estimated lb/hr). This method results in adjusted ETF which is tailored to the actual layout of the facility and the amount of pollutant released from each point.

a. Method One (Screening Method)

This methodology establishes a screening ETV (emission level above which modeling is required) for comparison against the source's proposed emissions increase level (see example problems at end of appendix). For each HAP for which new, or increases, in emissions are proposed in the NOI:

1. Select the appropriate ETF (see Table 5 of UACR307-410-4.1c) for each pollutant release point or area (installation). Selection of ETFs is based on the information specified under UACR307-410-4.1c(iB) and the classification of the HAP proposed to be emitted.

2. Select the lowest valued ETF from the group of affected installations.

3. Multiply the lowest ETF times the HAP's TLV. This is the ETV (modeling trigger emissions level) for the HAP in lb/hr.

4. Compare the ETV's emission level against the sum of the proposed new or increase in emissions (in maximum estimated lb/hr) from all affected installations for the HAP. If the ETV is greater than or equal to the proposed new or increased emission level, the applicant source is not required to perform dispersion modeling or submit addition documentation under this rule for that particular HAP. If the ETV is less than the proposed new or increased emission level, the applicant source should proceed to Method Two for this HAP.

5. Repeat steps 1 through 4 for each proposed type of HAP.

b. Method Two (Weighted ETF Method)

This methodology establishes a weighted ETF which has been adjusted to represent the actual layout of the facility and the amount of pollutant released from each point or area (installation). The affected installation's ETF is weighed by the percentage of the increase for that particular installation to the total amount of emissions increase proposed by the applicant (see example problems at end of appendix). For each HAP for which new emissions, or increase in emissions is proposed in the NOI:

1. Select the appropriate ETF (see Table 5 of UACR307-410-4.1c) for each pollutant release point or area (installation). Selection of ETFs is based on the information specified under UACR307-410-4.1c and the classification of the HAP proposed to be emitted. Multiply each installation's ETF times the percentage of the total proposed new or increasing emissions level which will be released from that installation (in maximum estimated lb/hr). These are the adjusted ETFs for each affected installation.
   Example: For each installation the 'adjusted ETF' is equal to the installation's ETF times the estimated lb/hr emission increase at the installation divided by the total estimated emissions increase from all effected installations.
2. Sum the adjusted ETFs from the group of effected installations. This is the total adjusted ETF for the HAP.
3. Multiply the total adjusted ETF times the HAP's TLV. This is the adjusted ETV (modeling trigger emissions level) for the HAP in lb/hr.

4. Compared the ETV's emission level against the sum of the total proposed new or increase in emissions from all affected installations for the HAP. If the ETV is greater than or equal to the proposed new or increased emission level, the applicant source is not required to perform dispersion modeling or submit addition documentation under this rule for that particular HAP. If the ETV is less than the proposed new or increased emission level, the applicant source is required to perform dispersion modeling and submit addition documentation under this rule for that particular HAP.
5. Repeat steps 1 through 4 for each proposed type of HAP.

c. Working Examples

To best illustrate how this *determination* is to be made, we will use an example source submitting a NOI for 3 HAPs; toluene, hydrogen chloride, and zinc chromate (chromium compound).

Table 5 (UACR307-410-4): Emission Threshold Factors (ETF) For Hazardous Air Pollutants

Distance to Property Boundary	Acute	Chronic	Carcinogenic
Vertically-Restricted and Fugitive Emission Release Points			
20 meters or less	0.038	0.051	0.017
21 - 50 meters	0.051	0.066	0.022
51 - 100 meters	0.092	0.123	0.041
Beyond 100 meters	0.180	0.269	0.090
Vertically-Unrestricted Emission Release Points			
50 meters or less	0.154	0.198	0.066
51 - 100 meters	0.224	0.244	0.081
Beyond 100 meters	0.310	0.368	0.123

The user should first attempt to identify the health effect classification for each HAP, and the appropriate Threshold Limit Value (TLV) from the most current version of the "American Conference of Governmental Industrial Hygienists (ACGIH) - Threshold Limit Values for Chemical Substances and Physical Exposure" handbook (see definitions for TLV, acute, chronic, and carcinogenic in the UACR or Appendix VI of this document). The classification and TLV for the three pollutants are:

Toluene - classified as a chronic HAP. The TLV is 188 mg/m^3.
Hydrogen Chloride - classified as an acute HAP. The TLV is 7.5 mg/m^3.
Zinc Chromate (chromium compound) - classified as an carcinogenic HAP. The TLV is 0.01 mg/m^3.

The example applicant source submits the following information with its NOI

Installation 1 -
max. est. emission rates -
Toluene - 8 lb/hr
Hyd. Clor. - 0.24 lb/hr
Zinc Chrom. - 0.0002 lb/hr
release type - vent fan on side of building
release duration - 60 minutes/hour
release height - 15 feet
building height - 20 feet
distance to ambient air - 80 meters

Installation 2 -
max. est. emission rate -
Toluene - 5 lb/hr
Hyd. Clor. - 0.10 lb/hr
Zinc Chrom. - 0.0003 lb/hr
release type - stack w/ vent cover
release duration - 30 minutes/hour
release height - 28 feet
building height - 20 feet
distance to ambient air - 45 meters

Installation 3 -
max. est. emission rate -
Toluene - 10 lb/hr
Hyd. Clor. - 0.05 lb/hr
Zinc Chrom. - 0.0001 lb/hr
release type - stack without vent cover
release duration - 60 minutes/hour
release height - 24 feet
building height - 20 feet
distance to ambient air - 120 meters

Installation 4 -
max. est. emission rate -
Toluene - 12 lb/hr
Hyd. Clor. - 0.07 lb/hr
Zinc Chrom. - 0.0004 lb/hr
release type - stack without vent cap
release duration - 60 minutes/hour
release height - 28 feet
building height - 20 feet
distance to ambient air - 15 meters

Using Table 5 from the rule and the information above, we will work through each pollutant starting with toluene.

Example 1: Toluene

Method One

Total the maximum estimated lb/hr emissions rates from all of the installations. 8 + 5 + 10 + 12 = 35 lb/hr. The lowest emissions threshold factor (ETF) from Table 5 that applies to the installations are:

Installation 1: The release is vertically-restricted since the emissions are vented horizontally through the side wall (See definition for vertically restricted emissions release). Since the release is 80 m from the property boundary, the ETF is 0.123.

Installation 2: The release is vertically-restricted. The emissions are vented vertically through a stack, but the emissions are directed horizontally when striking the rain cap (See definition for vertically restricted emissions release). Since the release is 45 m from the property boundary, the ETF is 0.066.

Installation 3: The release is vertically-restricted. The emissions are vented vertically through a stack without a rain cap, but the release height is less than 1.3 times the building height (See definition for vertically restricted emissions release). Since the release is 120 m from the property boundary, the ETF is 0.269.

Installation 4: The release is vertically-unrestricted since the emissions are vented vertically through a stack without a rain cap and the release height is greater than 1.3 times the building height (See definition for vertically unrestricted emissions release). Since the release is 15 m from the property boundary, the ETF is 0.198.

Installation 2 has the lowest ETF, 0.066. This will be the appropriate ETF for this method. Next we calculate the Emissions Threshold Value (ETV) which is the ETF times the HAP's TLV - 0.066 m^3@lb / mg@hr x 188 mg/m^3 = 12.4 lb/hr. Since the maximum estimated emission rate exceeds the emission threshold value, the applicant should move forward with method two.

Method Two

The maximum estimated lb/hr emissions rate from all of the installations is 35 lb/hr. Using the information from method one above, the adjusted ETFs for each installation are:

Installation 1: Adjusted ETF_1 = 0.123 x 8 lb/hr ÷ 35 lb/hr = 0.028
Installation 2: Adjusted ETF_2 = 0.066 x 5 lb/hr ÷ 35 lb/hr = 0.009
Installation 3: Adjusted ETF_3 = 0.269 x 10 lb/hr ÷ 35 lb/hr = 0.077
Installation 4: Adjusted ETF_4 = 0.198 x 12 lb/hr ÷ 35 lb/hr = 0.068

The total adjusted ETF for the emissions increase is: Total Adjusted ETF = 0.028 + 0.009 + 0.077 + 0.068 = 0.182

The Emissions Threshold Value (ETV) which is the Total Adjusted ETF times the HAP's TLV is: 0.182 m^3/mg/hr x 188 mg/m^3 = 34.2 lb/hr. Since the maximum estimated emission rate exceeds the emission threshold value (35 lb/hr > 34.2 lb/hr), dispersion modeling is required for toluene.

Example 2: Hydrogen Chloride

Method One

For acute HAPs, it is very important to take into consideration that very short term exposure to these HAPs may result in adverse health effects. Therefore, when dealing with batch process installations having a release duration of less than one hour, the maximum lb/hr emission rate should be reflective of an identical process having a release rate of one hour or more. In the case of installation 2, the release duration is 30 minutes, therefore the maximum lb/hr release rate for installation 2 should be; (60 min./ 30 min.) x 0.10 lb/hr = 0.20 lb/hr.

The total maximum estimated lb/hr emissions rates from all of the installations is: 0.24+0.20+0.05+0.07 = 0.56 lb/hr.
From the source's release information above, choose the lowest emissions threshold factor (ETF) from Table 5 that applies to the installations.

Installation 1: The release is vertically-restricted at 80 m from the property boundary, the ETF is 0.092.
Installation 2: The release is vertically-restricted at 45 m from the property boundary, the ETF is 0.051.
Installation 3: The release is vertically-restricted at 120 m from the property boundary, the ETF is 0.180.
Installation 4: The release is vertically-unrestricted at 15 m from the property boundary, the ETF is 0.154.

Thus installation 2 has the lowest ETF, 0.051. This will be the appropriate ETF for this method.

The Emissions Threshold Value (ETV) which is the ETF times the HAP's TLV is: 0.051 m^3/lb / mg/hr x 7.5 mg/m^3 = 0.383 lb/hr. Since the maximum estimated emission rate exceeds the emission threshold value, the applicant should move forward with method two.

Method Two

The maximum estimated lb/hr emissions rate from all of the installations is 0.56 lb/hr. Using the information from method one above, the adjusted ETFs for each installation are:

Installation 1: Adjusted ETF1 = 0.092 x 0.24 lb/hr ÷ 0.56 lb/hr = 0.039
Installation 2: Adjusted ETF2 = 0.051 x 0.20 lb/hr ÷ 0.56 lb/hr = 0.018
Installation 3: Adjusted ETF3 = 0.180 x 0.05 lb/hr ÷ 0.56 lb/hr = 0.016

Installation 4: Adjusted ETF4 = 0.154 x 0.07 lb/hr ÷ 0.56 lb/hr = 0.019

The total adjusted ETF for the emissions increase is: Total Adjusted ETF = 0.039 + 0.018 + 0.016 + 0.019 = 0.092

The Emissions Threshold Value (ETV) which is the Total Adjusted ETF times the HAP's TLV is: 0.092 m^3/lb / mg/hr x 7.5 mg/m^3 = 0.69 lb/hr. Since the maximum estimated emission rate is less than the emission threshold value (0.56 lb/hr < 0.69 lb/hr), dispersion modeling is not required for hydrogen chloride.

Example 3: Zinc Chromate (Chromium Compound)

Method One

The total maximum estimated lb/hr emissions rates from all of the installations is: 0.0002 + 0.0001 + 0.0003 + 0.0004 = 0.0010 lb/hr. From the source's release information above, the ETFs from Table 5 that apply to the installations are:

Installation 1: The release is vertically-restricted at 80 m from the property boundary, the ETF is 0.041.
Installation 2: The release is vertically-restricted at 45 m from the property boundary, the ETF is 0.022.
Installation 3: The release is vertically-restricted at 120 m from the property boundary, the ETF is 0.090.
Installation 4: The release is vertically-unrestricted at 15 m from the property boundary, the ETF is 0.066.

Installation 2 has the lowest ETF, 0.022. This will be the appropriate ETF for this method.

The Emissions Threshold Value (ETV) which is the ETF times the HAP's TLV is: 0.022 m^3/lb / mg/hr x 0.01 mg/m^3 = 0.00022 lb/hr. Since the maximum estimated emission rate exceeds the emission threshold value, the applicant should move forward with method two.

Method Two

The maximum estimated lb/hr emissions rates from all of the installations is 0.0010 lb/hr. Using the information from method one above, the adjusted ETFs for each installation are:

Installation 1: Adjusted ETF1 = 0.041 x 0.0002 lb/hr ÷ 0.0010 lb/hr = 0.008
Installation 2: Adjusted ETF2 = 0.022 x 0.0001 lb/hr ÷ 0.0010 lb/hr = 0.002
Installation 3: Adjusted ETF3 = 0.090 x 0.0003 lb/hr ÷ 0.0010 lb/hr = 0.027
Installation 4: Adjusted ETF4 = 0.066 x 0.0004 lb/hr ÷ 0.0010 lb/hr = 0.026

The total adjusted ETF for the emissions increase is: Total Adjusted ETF = 0.008 + 0.002 + 0.027 + 0.026 = 0.063

The Emissions Threshold Value (ETV) which is the Total Adjusted ETF times the HAP's TLV is: 0.063 m^3/lb / mg/hr x 0.01 mg/m3 = 0.00063 lb/hr. Since the maximum estimated emission rate exceeds the emission threshold value (0.001 lb/hr < 0.00063 lb/hr), dispersion modeling is required for zinc chromate.

Appendix II

Minimum Requirements to Establish Data Representativeness

A. Physiographic Analysis

Analysis of local terrain features extending out to 1 mile radius from the site and on a regional scale including several townships for overall impact. The analysis must include the following:

1. Two sites must fall in the same generic category of terrain:
   a. Flat terrain
   b. Shoreline conditions
   c. Complex terrain
      1) Three dimensional terrain
      2) Simple valley
      3) Complex valley
      4) Two dimensional terrain features

2. For representativeness of sites in complex terrain the following conditions must be similar:
   a. Alignments of major terrain features in north-south orientation
   b. Ratios of height of valley walls to width of valley and terrain profiles
   c. Height of ridge to length of ridge
   d. Height of isolated hills to width of hills at the bases
   e. Slope of terrain
   f. Ratio of terrain heights to stack/plume heights
   g. Distance of proposed source from terrain features, i.e., valley wall, ridge, hill, etc.

B. Meteorological Analysis comparison must contain:

1. Comparison of regional meteorology to include typical synoptic weather patterns.
   a. Comparison of site meteorology to include similarity of wind flows, temperatures, inversion types/periods, etc.
   b. Comparison of the plume rise characteristics for each site.

Appendix III

Air Quality Modeling Checklist

1. Has the person performing the modeling analysis contacted a member of the UDAQ - Technical Analysis staff to discuss the specific requirements for modeling the subject source? Yes _____ No _____
   Has a modeling protocol been submitted to the UDAQ for the analysis? Yes_____ No _____
2. Has an Emission Summary Table been submitted? Yes _____ No _____
3. Has a Stack Parameters Summary Table been submitted? Yes_____ No _____
4. Is a Plot Plan Summary showing UTM coordinates and the following items included with the analysis?
   - Emissions Release Locations Yes _____ No _____
   - Nearby Buildings Yes _____ No _____
   - Property Lines Yes _____ No _____
   - Fence Lines / Areas of Controlled Access Yes _____ No _____
   - Roads Yes _____ No _____
6. Are topographic maps showing the following items included with the analysis?
   - Source locations. Yes _____ No _____
   - Contour lines. Yes _____ No _____
   - Receptor locations. Yes _____ No _____
   - Maximum impact locations. Yes _____ No _____
7. Has a Nearby Building Dimensions Summary Table been submitted? Yes _____ No _____
8. Model Selection
   a. Terrain modeled: Simple _____ Intermediate _____ Complex _____
   b. Was SCREEN3 used? Yes _____ No _____
   c. Was ISCST3 used? Yes _____ No _____
   d. Was Building Downwash modeled? Yes _____ No _____
   e. Was COMPLEX-1 used? Yes _____ No _____
   f. Were other models used? Yes _____ No _____
      If so, which model(s) was used: _____
      Why: _____
      _____
   h. Do the model input options elected for the analysis agree with EPA's "Guidelines on Air Quality Models"? Yes _____ No _____
      If no, explain options used, and why they were selected: _____
      _____
      _____
   I. Was deposition modeled near the plant? Yes _____ No _____
9. Was Urban or Rural dispersion used in the analysis? _____
   Why? _____
10. Meteorology
    a. Was screening meteorology used? Yes _____ No _____
       If yes, For simple terrain impacts:
       Was the Full Meteorology array used? Yes _____ No _____
       Do the screening wind directions used in the analysis apply to all quadrants surrounding the subject source? Yes _____ No _____
       For complex terrain impacts:
    b. Was actual meteorological data used? Yes _____ No _____
       If yes, Where was the meteorological data collected?
       Surface: Site: _____ UTM Easting _____ UTM Northing _____
       Upper-air: Site: _____ UTM Easting _____ UTM Northing _____

Which member of the UDAQ staff did you contact regarding the accuracy of using this data?

_____

How many years of meteorological data were used in the analysis? _____

11. Receptors

a. Refined modeling: List receptor grid(s) type, spacing, and intervals used in the analysis.

Type:	Spacing:	Interval:	Origin:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Were actual receptor elevations used in the analysis? Yes _____ No _____

If yes, what was the source of the elevation. (List map types, names, scale, digitized database,etc)

_____

_____

12. Impact Analysis Summary:

a. Were the modeling results summarized for each pollutant and each averaging period?
Yes _____ No _____

Are maximum impacts compared against NAAQS and PSD increments?
Yes _____ No _____

Are the controlling meteorology conditions summarized? Yes _____ No _____

Are the controlling receptor location and elevations summarized? Yes _____ No _____

b. Were all existing and proposed emissions from this source included in the analysis?
Yes _____ No _____

If no, why? _____

_____

c. Were ambient background levels included in the NAAQS analysis results?
Yes _____ No _____

Source of Background Concentration information_____

_____

d. Were partial operating loads evaluated for the source? Yes _____ No _____

e. Were impacts on PSD Class I areas evaluated in the analysis? Yes _____ No _____

Distance(s) to Class I area. _____, _____, _____.

f. Were building cavity regions evaluated using the SCREEN2C model?Yes _____ No _____

g. PSD Sources:

Were other Air Quality Related Values addressed? Yes _____ No _____

Was a visibility analysis performed for any Class I areas? Yes _____ No _____

Was a regional haze analysis performed for any Class I areas? Yes _____ No _____

h. Was it necessary to include the impact of other contributing sources in the analysis?
Yes _____ No _____

If yes, were those sources included in the Emissions and Stack Parameters Summary?
Yes _____ No _____

I. Have you included input, output, meteorological data, and technical support files along with a detailed description of these files on 3.5 diskette with your modeling analysis submittal?
Yes _____ No _____

Name and Telephone Number of Modeling Contact.

Name _____

Phone # _____

Signature of person responsible for modeling: _____ Date: _____

Appendix IV

Utah Air Conservation Rule Language and Definitions for Modeling

UACR307-410 Emissions Impact Analysis

R307-410-2. Use of Dispersion Models.

All estimates of ambient concentrations derived in meeting the requirements of R307 shall be based on appropriate air quality models, data bases, and other requirements specified in 40 CFR Part 51, Appendix W, (Guideline on Air Quality Models). Where an air quality model specified in the Guideline on Air Quality Models or other EPA approved guidance documents is inappropriate, the Executive Secretary may authorize the modification of the model or substitution of another model. In meeting the requirements of federal law, any modification or substitution will be made only with the written approval of the Administrator, EPA.

R307-410-3. Modeling of Criteria Pollutant Impacts in Attainment Areas.

Prior to receiving an approval order, a new source in an attainment area with a total controlled emission rate per pollutant greater than or equal to amounts specified in Table 1, or a modification to an existing source located in an attainment area which increases the total controlled emission rate per pollutant of the source in an amount greater than or equal to those specified in Table 1, shall conduct air quality modeling, as identified in R307-410-2, to estimate the impact of the new or modified source on air quality unless previously performed air quality modeling for the source indicates that the addition of the proposed emissions increase would not violate a National Ambient Air Quality Standard or a Prevention of Significant Deterioration increment, as determined by the Executive Secretary.

TABLE 1

POLLUTANT	EMISSIONS
sulfur dioxide	40 tons per year
oxides of nitrogen	40 tons per year
PM10 - fugitive emissions and fugitive dust	5 tons per year
PM10 - non-fugitive emissions or non-fugitive dust	15 tons per year
carbon monoxide	As required under R307-405-6(2)
lead	0.6 tons per year

R307-410-4. Documentation of Ambient Air Impacts for Hazardous Air Pollutants.

(1) Prior to receiving an approval order under R307-401, a source shall provide documentation of increases in emissions of hazardous air pollutants as required under (c) below for all installations not exempt under (a) below.

(a) Exempted Installations.

(i) The requirements of R307-410-4 do not apply to installations which are subject to or are scheduled to be subject to an emission standard promulgated under 42 U.S.C. 7412 at the time a notice of intent is submitted, except as defined in (ii) below. This exemption does not affect requirements otherwise applicable to the source, including requirements under R307-401.

(ii) The executive secretary may, upon making a written determination that the delay in the implementation of an emission standard under 40 CFR Part 63 might reasonably be expected to pose an unacceptable risk to public health, require, on a case-by-case basis, notice of intent documentation of emissions consistent with (c) below.

(A) The executive secretary shall notify the source in writing of the preliminary decision to require some or all of the documentation as listed in (c) below.

(B) The source may respond in writing within thirty days of receipt of the notice, or such longer period as the executive secretary approves.

(C) In making a final determination, the executive secretary shall document objective bases for the determination, which may include public information and studies, documented public comment, the applicant's written response, the physical and chemical properties of emissions, and ambient monitoring data.

(b) Lead Compounds Exemption. The requirements of R307-410-4 do not apply to emissions of lead compounds. Lead compounds shall be evaluated pursuant to requirements of R307-410-3.

(c) Submittal Requirements.

(i) Each applicant's notice of intent shall include:

(A) the estimated maximum pounds per hour emission rate increase from each affected installation,

(B) the type of release, whether the release flow is vertically restricted or unrestricted, the maximum release duration in minutes per hour, the release height measured from the ground, the height of any adjacent building or structure, the shortest distance between the release point and any area defined as "ambient air" under 40 CFR 50.1(e) for each installation for which the source proposes an emissions increase,

(C) the emission threshold value, calculated to be the applicable threshold limit value - time weighted average (TLV-TWA) or the threshold limit value - ceiling (TLV-C) multiplied by the appropriate emission threshold factor listed in Table 2, except in the case of arsenic, benzene, beryllium, and ethylene oxide which shall be calculated using chronic emission threshold factors, and formaldehyde, which shall be calculated using an acute emission threshold factor. For acute hazardous air pollutant releases having a duration period less than one hour, this maximum pounds per hour emission rate shall be consistent with an identical operating process having a continuous release for a one-hour period.

TABLE 2
EMISSION THRESHOLD FACTORS FOR HAZARDOUS AIR POLLUTANTS
(cubic meter pounds per milligram hour)

VERTICALLY-RESTRICTED AND FUGITIVE EMISSION RELEASE POINTS

DISTANCE TO PROPERTY BOUNDARY	ACUTE	CHRONIC	CARCINOGENIC
20 Meters or less	0.038	0.051	0.017
21 - 50 Meters	0.051	0.066	0.022
51 - 100 Meters	0.092	0.123	0.041
Beyond 100 Meters	0.180	0.269	0.090

VERTICALLY-UNRESTRICTED EMISSION RELEASE POINTS

DISTANCE TOPROPERTY BOUNDARY	ACUTE	CHRONIC	CARCINOGENIC
50 Meters or less	0.154	0.198	0.066
51 - 100 Meters	0.224	0.244	0.081
Beyond 100 Meters	0.310	0.368	0.123

(ii) A source with a proposed maximum pounds per hour emissions increase equal to or greater than the emissions threshold value shall include documentation of a comparison of the estimated ambient concentration of the proposed emissions with the applicable toxic screening level specified in (d) below.

(iii) A source with an estimated ambient concentration equal to or greater than the toxic screening level shall provide additional documentation regarding the impact of the proposed emissions. The executive secretary may require such documentation to include, but not be limited to:

(A) a description of symptoms and adverse health effects that can be caused by the hazardous air pollutant,

(B) the exposure conditions or dose that is sufficient to cause the adverse health effects,

(C) a description of the human population or other biological species which could be exposed to the estimated concentration,

(D) an evaluation of land use for the impacted areas,

(E) the environmental fate and persistency.

(d) Toxic Screening Levels and Averaging Periods.

(i) The toxic screening level for an acute hazardous air pollutant is 1/10th the value of the TLV-C, and the applicable averaging period shall be:

(A) one hour for emissions releases having a duration period of one hour or greater,

(B) one hour for emission releases having a duration period less than one hour if the emission rate used in the model is consistent with an identical operating process having a continuous release for a one-hour period or more, or

(C) the dispersion model's shortest averaging period when using an applicable model capable of estimating ambient concentrations for periods of less than one hour.

(ii) The toxic screening level for a chronic hazardous air pollutant is 1/30th the value of the TLV-TWA, and the applicable averaging period shall be 24 hours.

(iii) The toxic screening level for all carcinogenic hazardous air pollutants is 1/90 the value of the TLV-TWA, and the applicable averaging period shall be 24 hours, except in the case of formaldehyde which shall be evaluated consistent with (d)(i) above and arsenic, benzene, beryllium, and ethylene oxide which shall be evaluated consistent with (d)(ii) above.

R307-410-5. Stack Heights and Dispersion Techniques.

(1) The degree of emission limitation required of any source for control of any air contaminant to include determinations made under R307-401, R307-403 and R307-405, must not be affected by so much of any source's stack height that exceeds good engineering practice or by any other dispersion technique except as provided in (2) below. This does not restrict, in any manner, the actual stack height of any source.

(2) The provisions in R307-410-5 shall not apply to:

(a) stack heights in existence, or dispersion techniques implemented on or before December 31, 1970, except where pollutants are being emitted from such stacks or using such dispersion techniques by sources which were constructed or reconstructed, or for which major modifications were carried out after December 31, 1970; or

(b) coal-fired steam electric generating units subject to the provisions of Section 118 of the Clean Air Act, which commenced operation before July 1, 1957, and whose stacks were constructed under a construction contract awarded before February 8, 1974.

(3) The Executive Secretary may require the source owner or operator to provide a demonstration that the source stack height meets good engineering practice as required by R307-410-5.

Definitions Used in the Rule

"Acute Hazardous Air Pollutant" means any noncarcinogenic hazardous air pollutant for which a threshold limit value - ceiling (TLV-C) has been adopted by the American Conference of Governmental Industrial Hygienists in its "Threshold Limit Values for Chemical Substances and Physical Agents - Biological Exposure Indices, pages 15 - 72 (2000)."

"Chronic Hazardous Air Pollutant" means any noncarcinogenic hazardous air pollutant for which a threshold limit value - time weighted average (TLV-TWA) having no threshold limit value - ceiling (TLV-C) has been adopted by the American Conference of Governmental Industrial Hygienists in its "Threshold Limit Values for Chemical Substances and Physical Agents -Biological Exposure Indices, pages 15 - 72 (2000)."

"Carcinogenic Hazardous Air Pollutant" means any hazardous air pollutant that is classified as a known human carcinogen (A1) or suspected human carcinogen (A2) by the American Conference of Governmental Industrial Hygienists in its "Threshold Limit Values for Chemical Substances and Physical Agents -Biological Exposure Indices, pages 15 - 72 (2000)."

"Hazardous Air Pollutant (HAP)" means any pollutant listed by the EPA as a hazardous air pollutant in conformance with Section 112(b) of the Clean Air Act. A list of these pollutants is available at the Division of Air Quality.

"Installation" means a discrete process with identifiable emissions which may be part of a larger industrial plant. Pollution equipment shall not be considered a separate installation or installations.

"Threshold Limit Value - Ceiling (TLV-C)" means the airborne concentration of a substance which may not be exceeded, as adopted by the American Conference of Governmental Industrial Hygienists in its "Threshold Limit Values for Chemical Substances and Physical Agents - Biological Exposure Indices (2000), pages 15 - 72."

"Threshold Limit Value - Time Weighted Average (TLV-TWA)" means the time-weighted airborne concentration of a substance adopted by the American Conference of Governmental Industrial Hygienists in its "Threshold Limit Values for Chemical Substances and Physical Agents - Biological Exposure Indices (2000), pages 15 - 72."

"Toxic Screening Level" means an ambient concentration of an air contaminant equal to a threshold limit value - ceiling (TLV- C) or threshold limit value -time weighted average (TLV-TWA) divided by a safety factor.

"Vertically Restricted Emissions Release" means the release of an air contaminant through a stack or opening whose flow is directed in a downward or horizontal direction due to the alignment of the opening or a physical obstruction placed

beyond the opening, or at a height which is less than 1.3 times the height of an adjacent building or structure, as measured from ground level.

"Vertically Unrestricted Emissions Release" means the release of an air contaminant through a stack or opening whose flow is directed upward without any physical obstruction placed beyond the opening, and at a height which is at least 1.3 times the height of an adjacent building or structure, as measured from ground level.